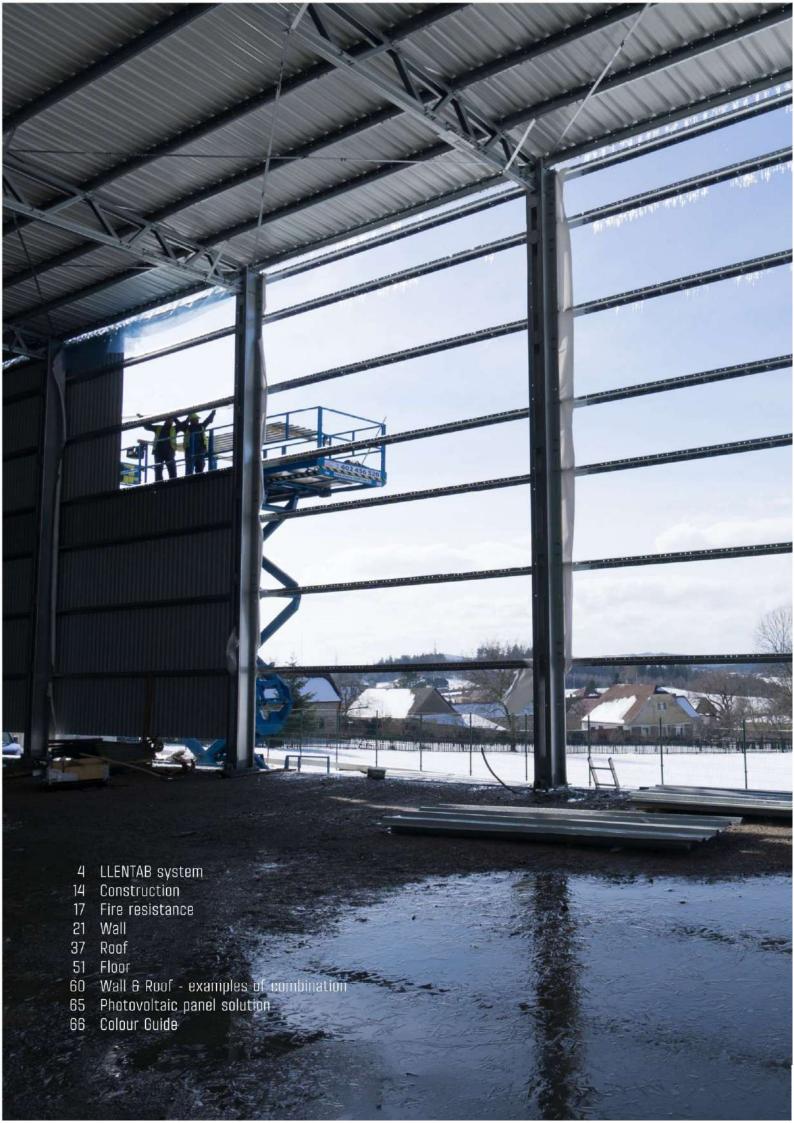


DETAILED TECHNICAL ATION





LLENTAB STEEL BUILDINGS

LLENTAB steel constructions are designed from elements made from cold-bent profiles that are screwed together. The profiles are manufactured by means of
continuous rolling or bending on press brakes. The elements are
made of hot-dip zinc coated steel coils of high-strength steel.
The individual pieces are joined with class 8.8 screws
[most often M12 or M16].

LLENTAB manufactures all profiles from high-strength steel. Profiles with a material thickness of 1.5 to 7 mm are made from hot-dip zinc coated steel coils. Cold-rolled hot-dip zinc coated profiles guarantee long-term quality and low steel consumption. Profiles with material thickness up to 2 mm are protected by a layer of Z275 zinc [275 g/m²). From the thickness of 2.5 mm onwards, Z450 zinc coating [450 g/m²] is used as standard.

The basic shapes of LLENTAB profiles are as follows: **Z-profiles** (for roof purlins and wall purlins), **C-profiles** (for columns, trusses, frame parts), **H-profiles** (for upper and lower chords of truss structures). Mounting holes are pre-formed in all profiles during production.

The structures are designed as frames with a truss bar determining the shape of the roof. The columns are designed as segmented elements with frame connectors or as truss columns. The truss girders are assembled from C-profiles and H-profiles. From the structural perspective, the frames are designed as double-hinged or fixed, or as hinged roof trusses on columns that are fixed (screwed or welded) or restrained in foundation.

All structures are designed to satisfy specific client requirements (dimensions, cladding, loading, windows, doors, gates, etc.). LLENTAB uses a modular system of floor plan dimensions with a span of 300 mm. This span affects the follow-up secondary structures, accessories and standard details. We are open to tailor-made client requirements and designs.

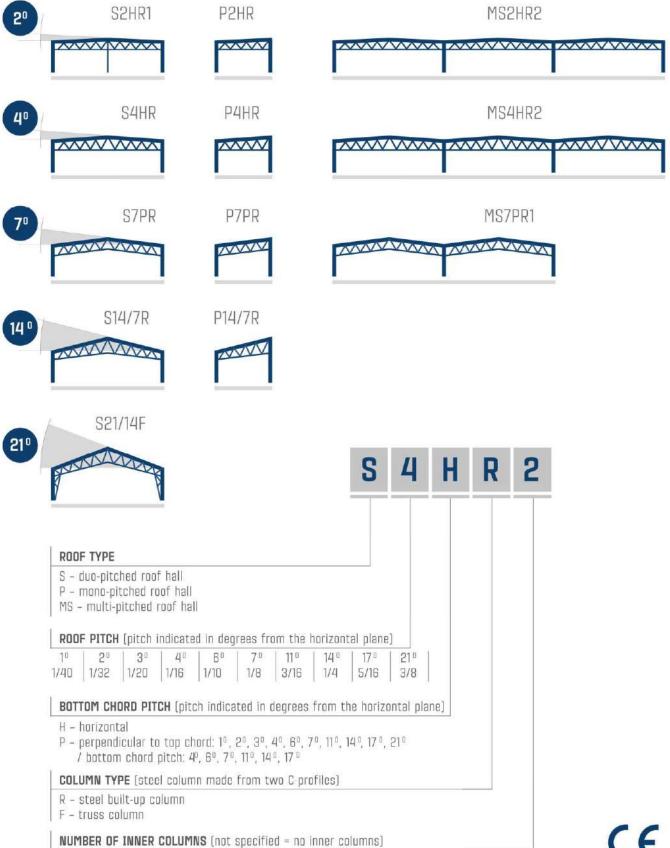
The optimal layout of the frames and the design of the hall structure take into account loading, cladding types and specific hall structure requirements if any.

LLENTAB's technical department we will be happy to prepare basic construction drawings for you free of charge which may be used for the preparation of project documentation.





HALL TYPES



LENIAB WWW.LLENTAB.COM

COLUMNS - STANDARD

2xC COLUMN

Column for standard load.

Battened cross-section made of two C-profiles

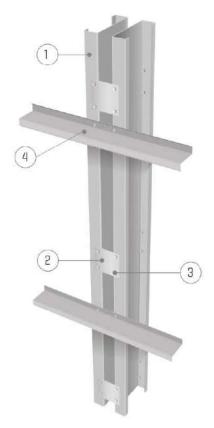
LLENTAB steel

QUADRO (4xC)

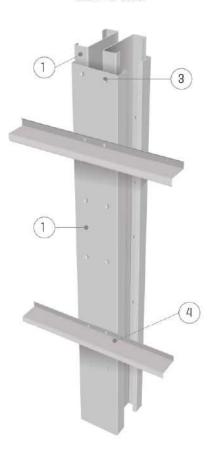
Reinforced column for heavy load and high hall. Closed assembly made of four separate C-profiles LLENTAB steel

TRUSS

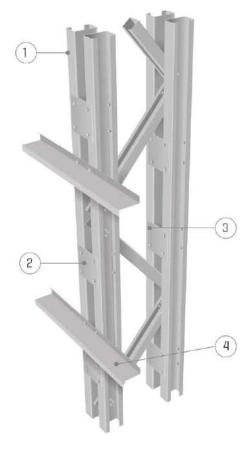
Reinforced column for very high hall. 2x2 C-profiles and diagonals (C-profiles) LLENTAB steel



2xC170: thickness 3/4/5/6 mm 2xC250: thickness 3/4/5/6 mm 2xC300: thickness 5/6 mm 2xC360: thickness 4/5/6 mm 2xC360: thickness 6 mm



4xC360: thickness 4/5/6 mm



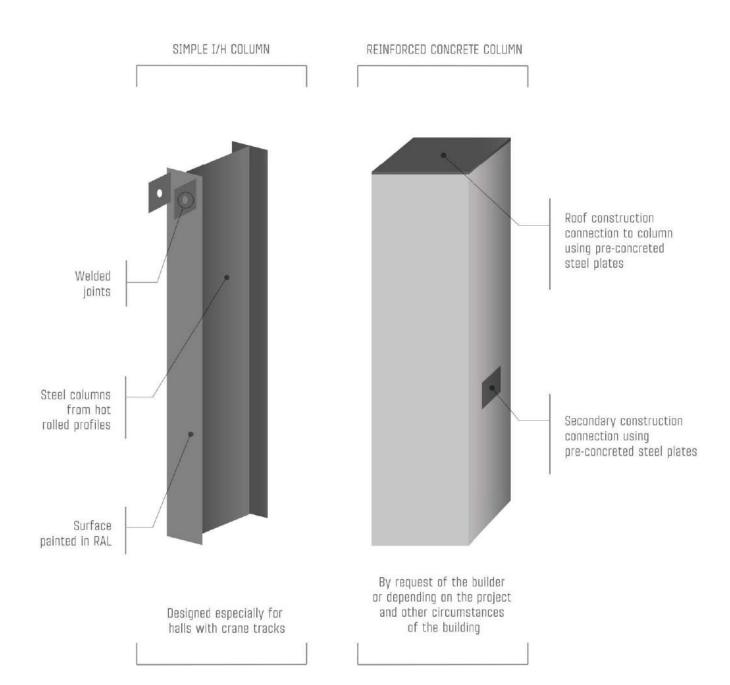
4xC170: thickness 3/4/5/6 mm 4xC250: thickness 3/4/5/6 mm (+combination 170 mm a 250 mm)

- 1 C-profile, hot-dip zinc coating (450 g/m²), pre-formed holes
- 2 Steel batten, hot-dip zinc coating [450 g/m²], pre-formed holes
- 3 Galvanized, mounting screw class 8.8 with pad and nut
- Wall purlin, hot-dip zinc coating (275g/m² or 450 g/m²), Z-profile





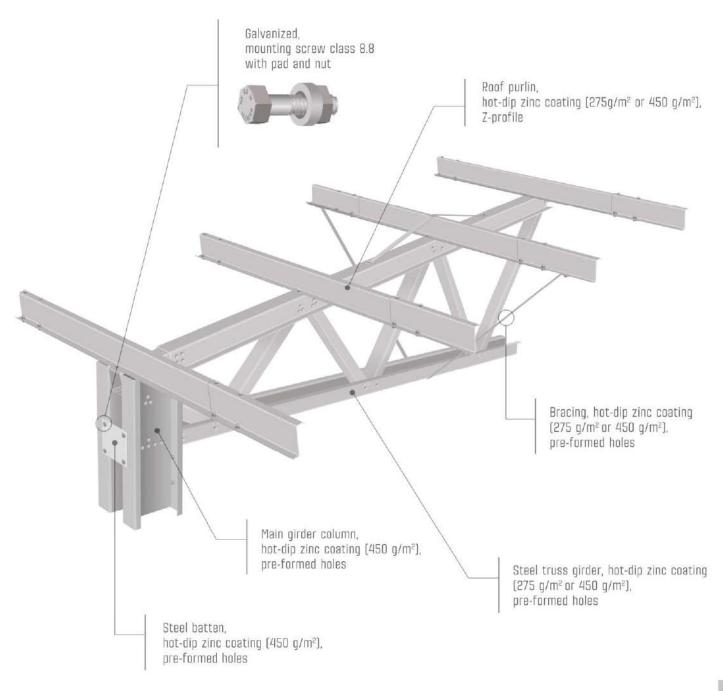
COLUMNS - VARIANTS





TRUSS GIRDER

Trusses are the primary supporting structure of the hall roof. The truss elements form the upper and lower chord, which are connected by diagonals. The pitch chords are most often made of "omega" shaped profiles or a pair of C-profiles. The diagonals are from one C-profile. The chords can be of different pitch. The pitch of the upper chord determines the resulting pitch of the roof.



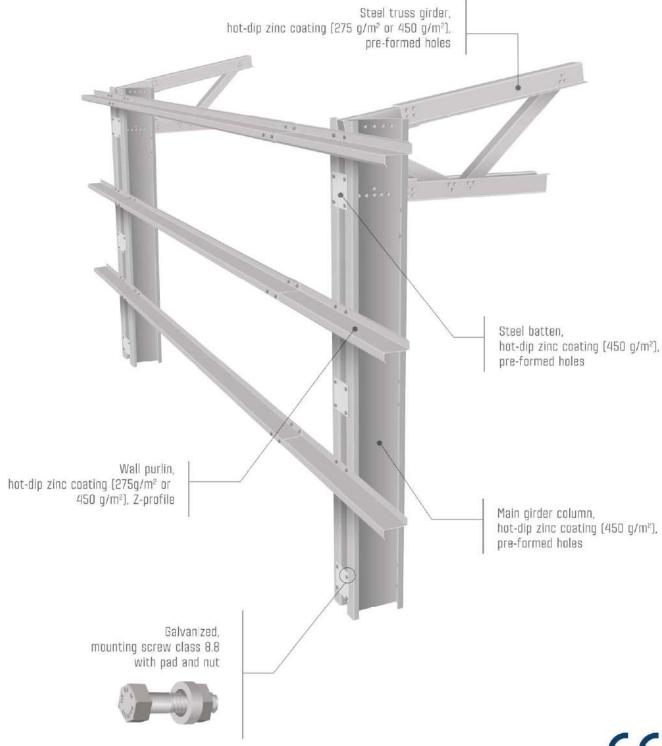






WALL PURLINS

Wall purlins are a secondary supporting structure of the hall wall anchored to the columns. They are horizontal beams that transfer the horizontal wind load from the wall cladding of panels or plates. Wall purlins are usually designed as joined beams. The load from the actual weight of the cladding is transferred to the foundation or plinth sill. Wall purlins are most often made from Z- or C-profiles.



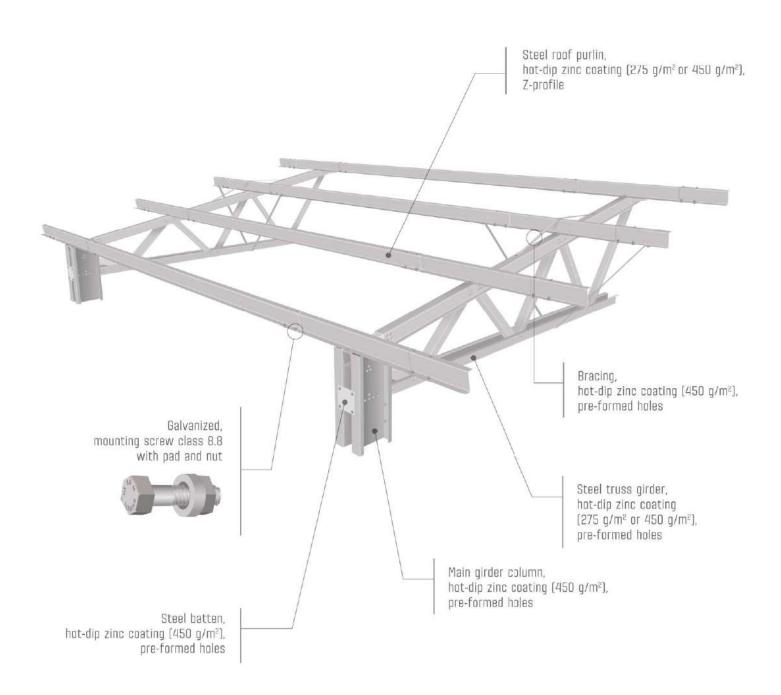






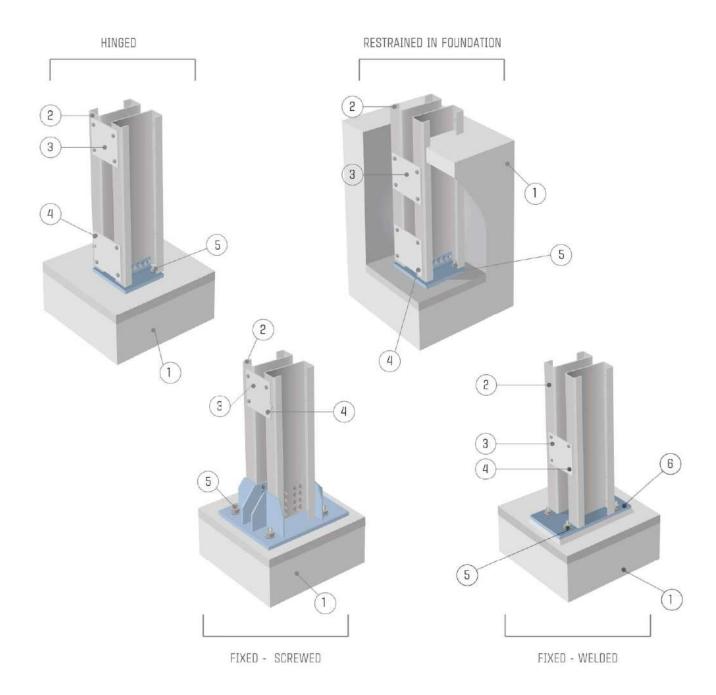
ROOF PURLINS

Roof purlins are a secondary supporting structure of the hall roof anchored to the trusses. These profiles carry the vertical wind load from the roof cladding. Roof purlins are usually designed as continuous beams and are also part of the roof reinforcement and stabilize the upper girder chord against buckling. Z-profiles are most often used for the roof purlins.





COLUMNS - FOUNDATION CONNECTION



1 Footing

Galvanized, mounting screw class 8.8 with pad and nut



- Main girder column,
 with hot-dip zinc coating
 (450 g/m2), pre-formed holes
- 5 Injectable anchors or cast-in anchors

(3) Batten

6 Foot plate welded to the column



COLUMN - TRUSS GIRDER connection

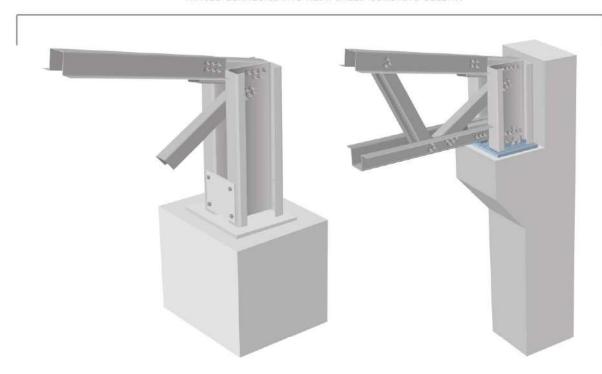
RIGID CONNECTION TO STEEL COLUMN

HINGED CONNECTION TO STEEL COLUMN



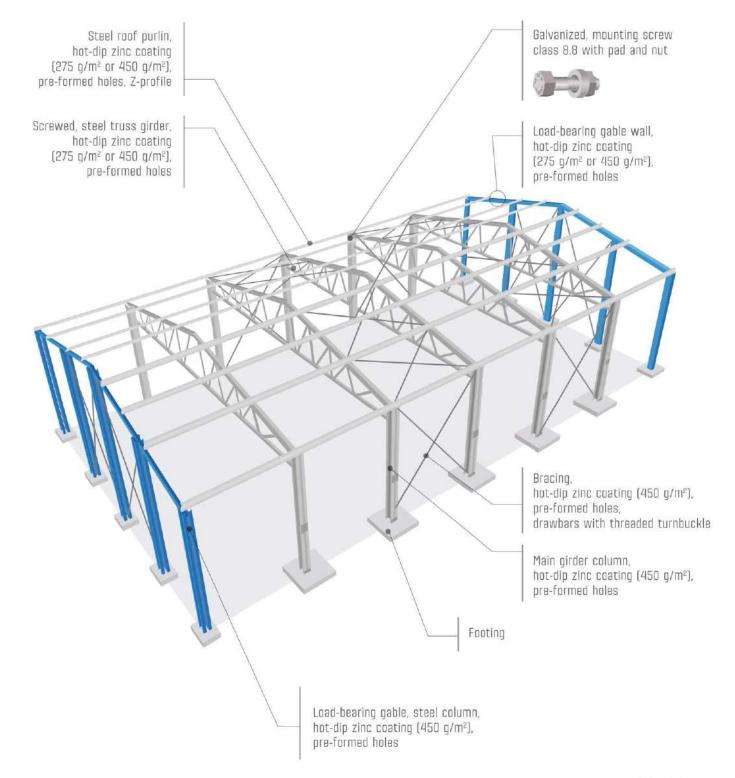


HINGED CONNECTION TO REINFORCED CONCRETE COLUMN





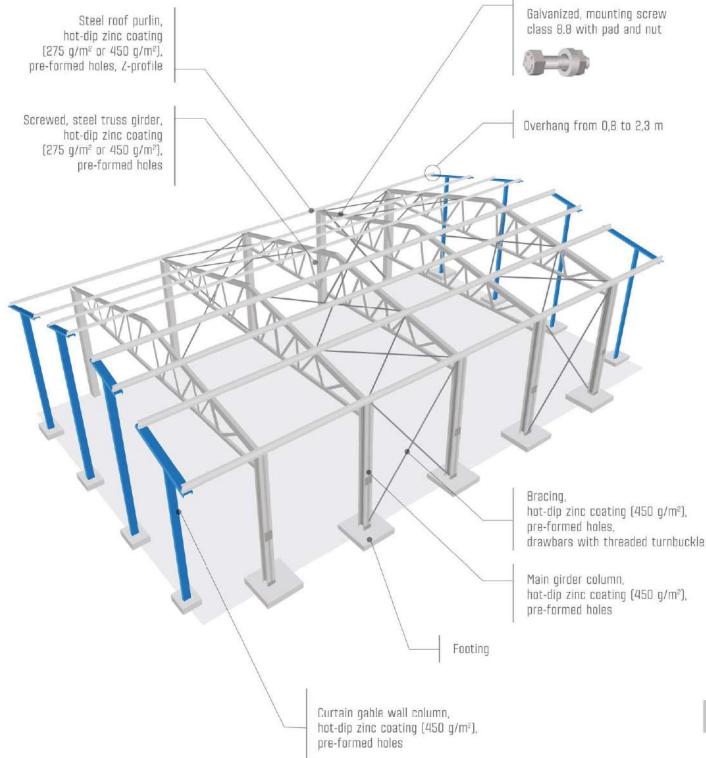
CONSTRUCTION with load-bearing gable wall







CONSTRUCTION with standard gable wall (overhang)



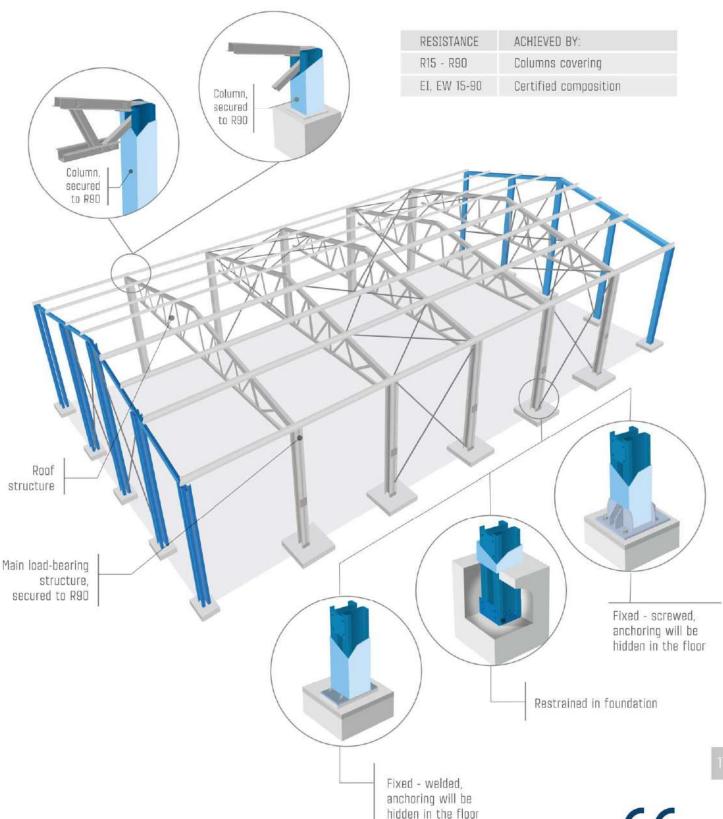






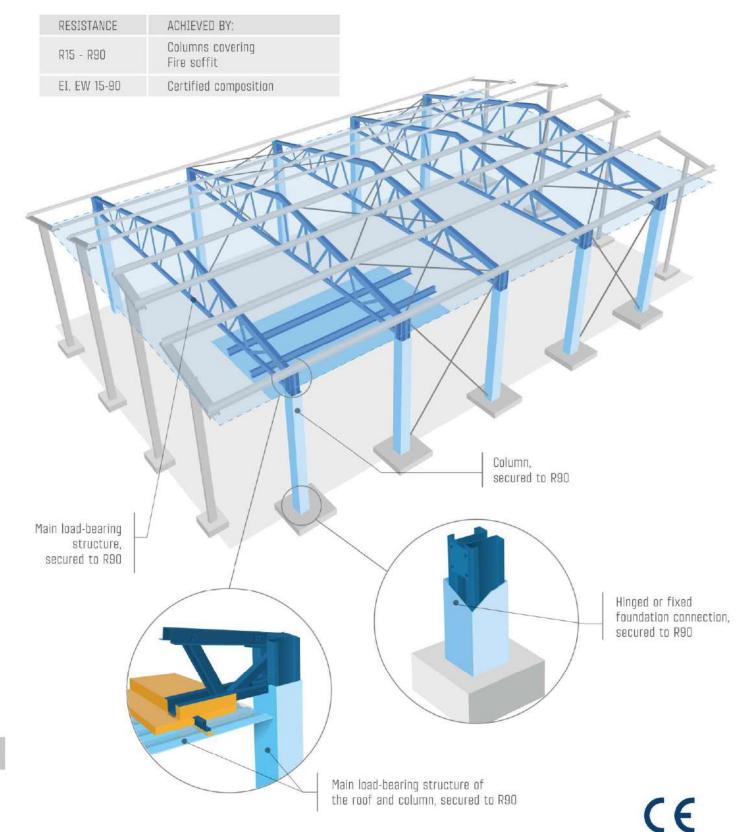


FIRE RESISTANCE walls - construction protection*



* roof without protection, walls keep standing after the roof has burnt EN 1090-

FIRE RESITANCE walls/roof - construction protection



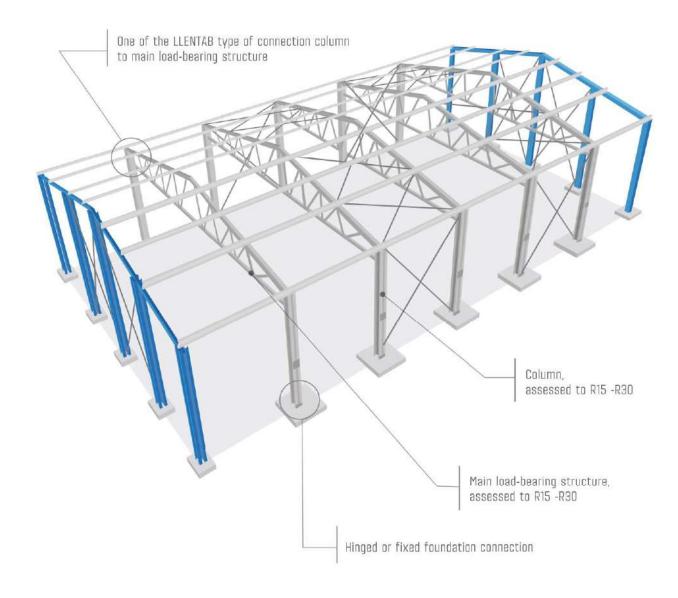
EN 1090-1





FIRE RESISTANCE walls/roof - calculated according to Eurocode

RESISTANCE	ACHIEVED BY:
R15	Calculated according to the standard curve or in the case of fitting sprinklers or smoke extraction, an expert opinion being made
R30	In the case of sprinklers or smoke extraction, carry out an expert opinion
EI, EW 15-30	Certified composition

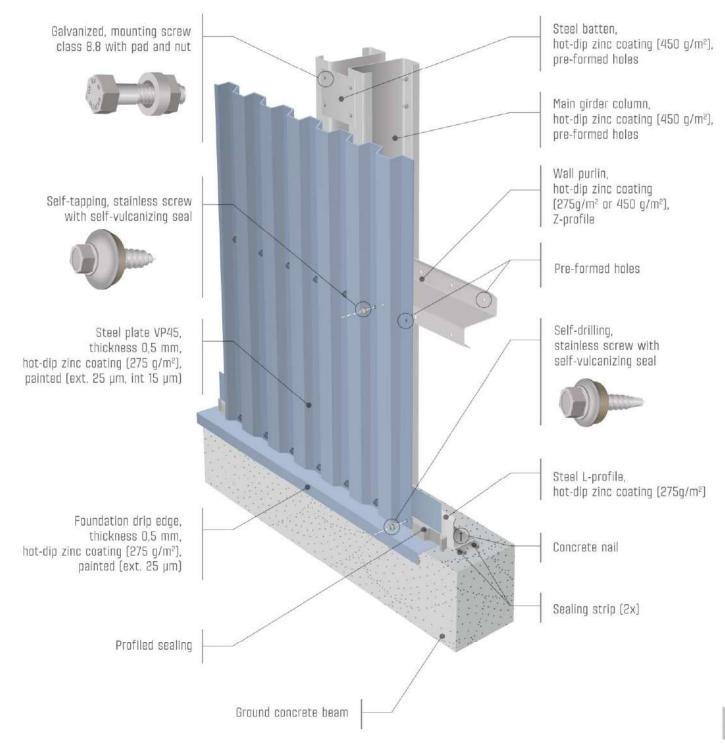








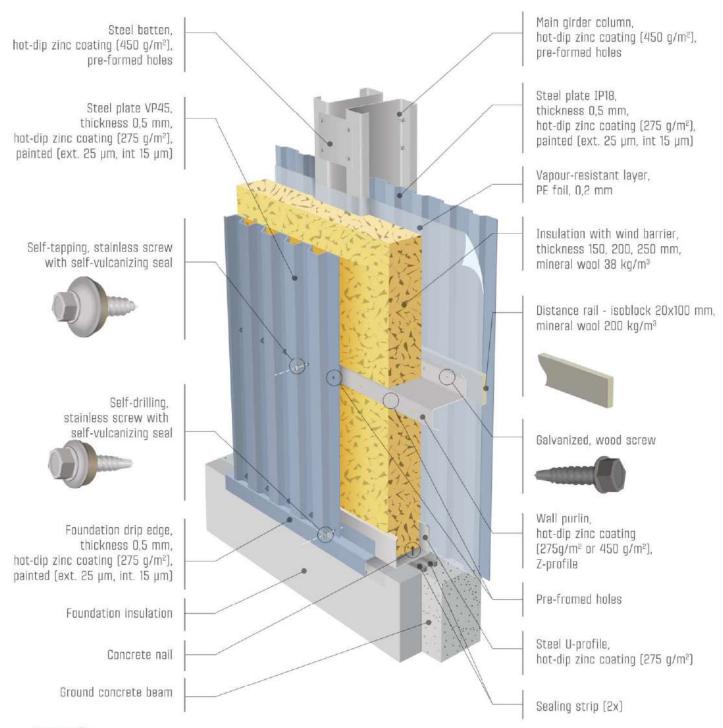
WALL - TYPE O Uninsulated







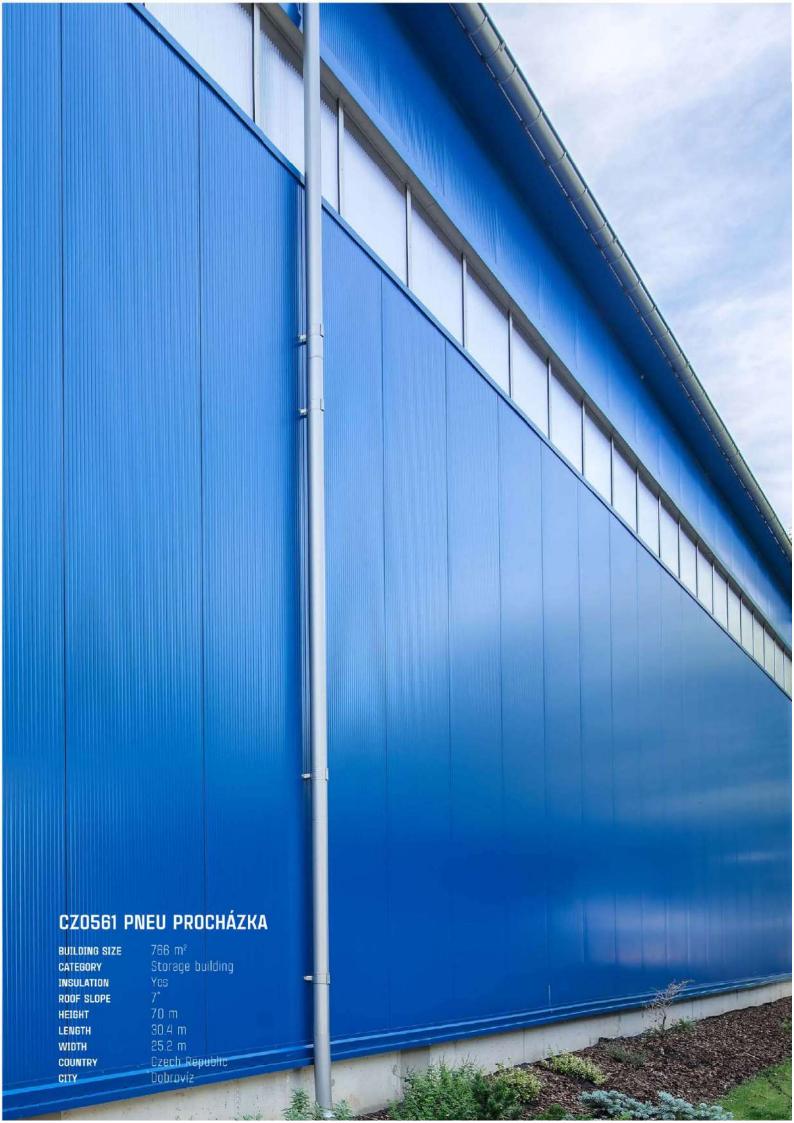
WALL - TYPE 4F wall insulation - compound cladding



Heat transfer			
coefficients Uc [W/m²K]	8-16°C	>16°C (2017)	>16°C (2021)
\mathbf{U}_{ϵ} required	0.45	0.23	0.20
Insulation thickness (mm)*	150	220	240
Uc	0.37	0.23	0.20
U _o	0.23	0.16	0.15

^{*} Insulation that meets required U,

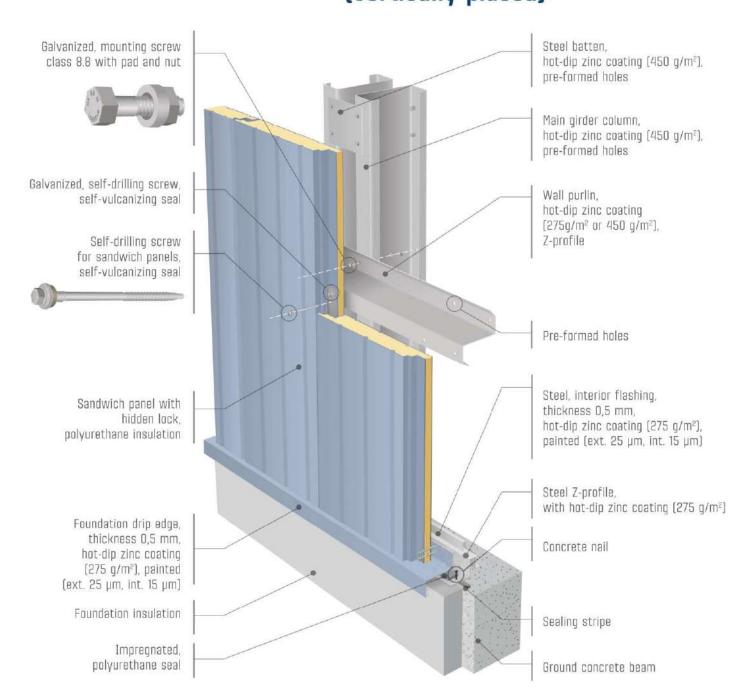








wall insulation - PUR sandwich panels (vertically placed)



8-16°C	PIR foam >16°C (2017)	>16°C (2021)
0.45	0.23	0.20
60	100	120
0.39	0.22	0.19
0.39	0.22	0.19
	0.45 60 0.39	8-16°C >16°C (2017) 0.45



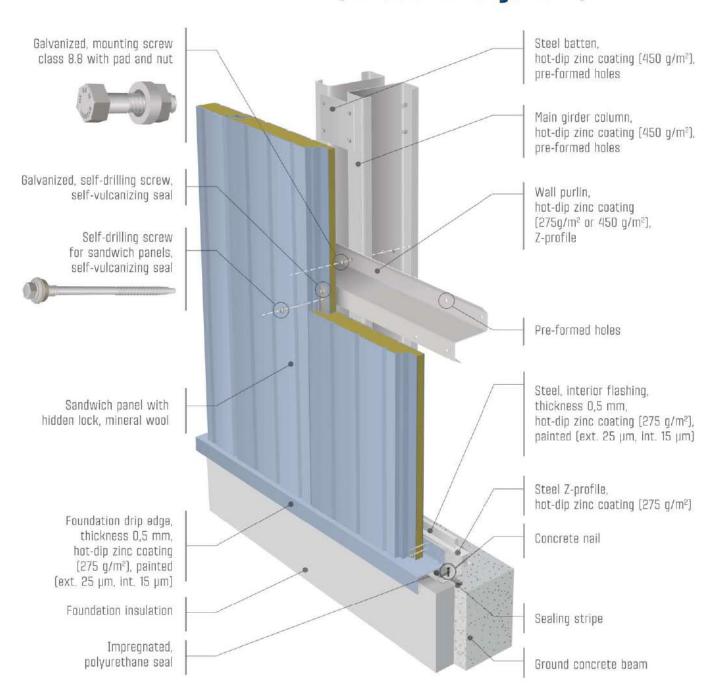




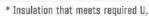




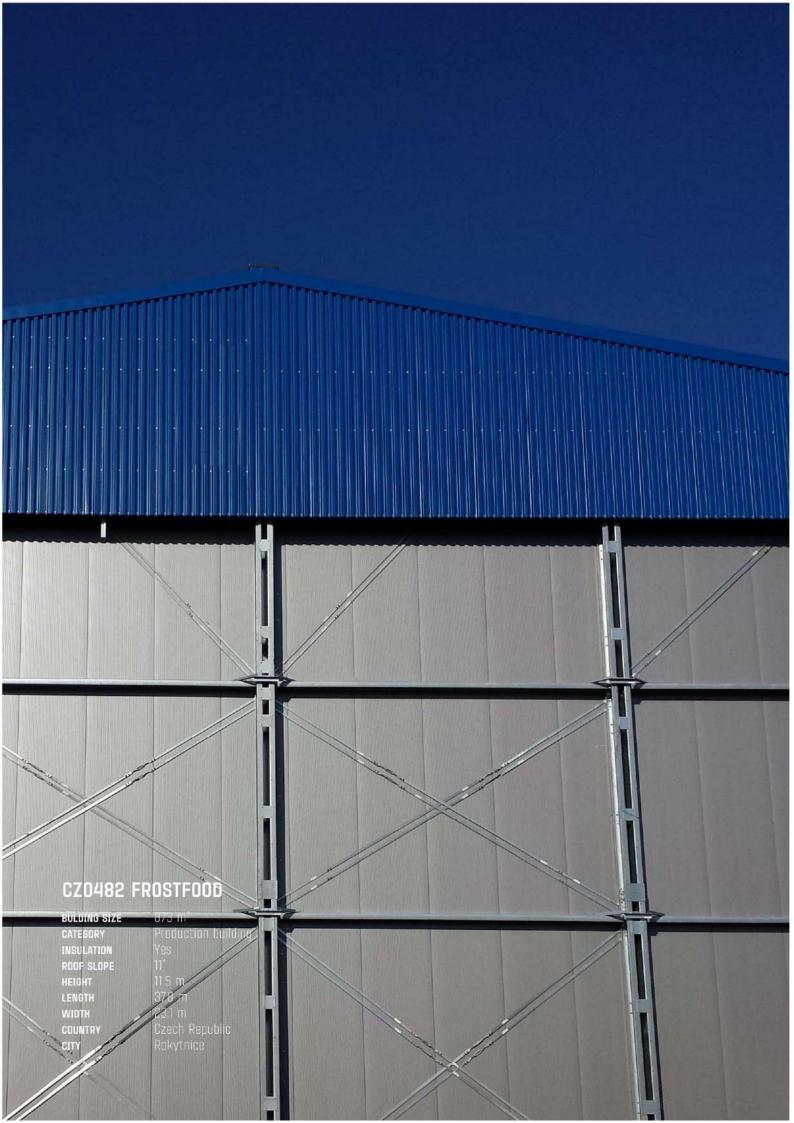
wall insulation - mineral wool sandwich panels (vertical arrangement)



Heat transfer coefficients Uc [W/m²K]	8-16°C	wool >16°C (2017)	>16°C (2021)
U _c required	0.45	0.23	0.20
Insulation thickness (mm)*	100	175	200
U_{ε}	0.38	0.23	0.20
U _o	0.38	0.23	0.20











Insulation thickness [mm]* 160

0.14

U.

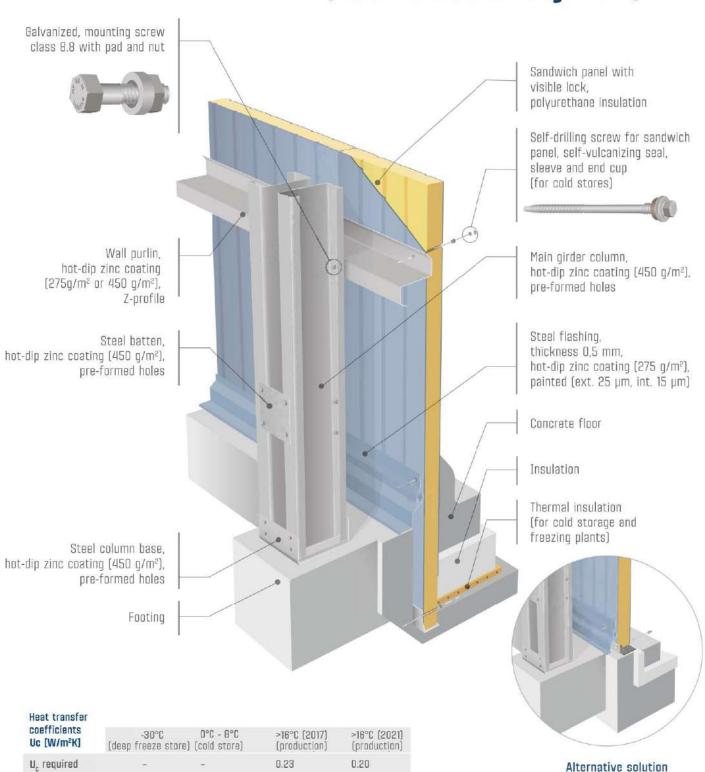
100

0.22

0.22

WALL - TYPE 6W

wall insulation - PUR sandwich panels (inner vertical arrangement)



* Insulation that meets required \mathbf{U}_{c}

120

0.19

100

0.22

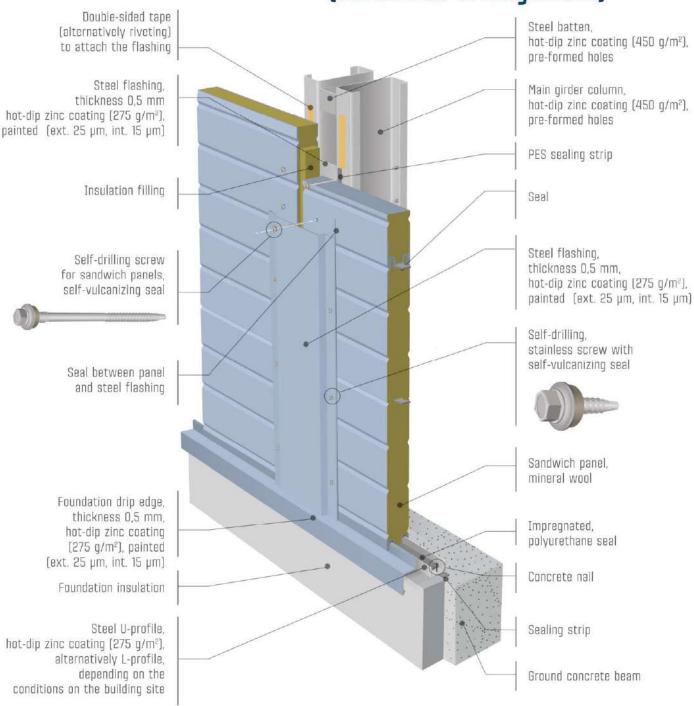
0.22

(€ EN 1090-1





wall insulation - mineral wool sandwich panels (horizontal arrangement)



Heat transfer coefficients Uc [W/m²K]	8-16°C	wool >16°C (2017)	>16°C (2021)
U _c required	0.45	0.23	0.20
Insulation thickness (mm)*	100	175	200
$U_{\scriptscriptstyle \mathbb{C}}$	0.38	0.23	0.19
U ₀	0.38	0.23	0.19

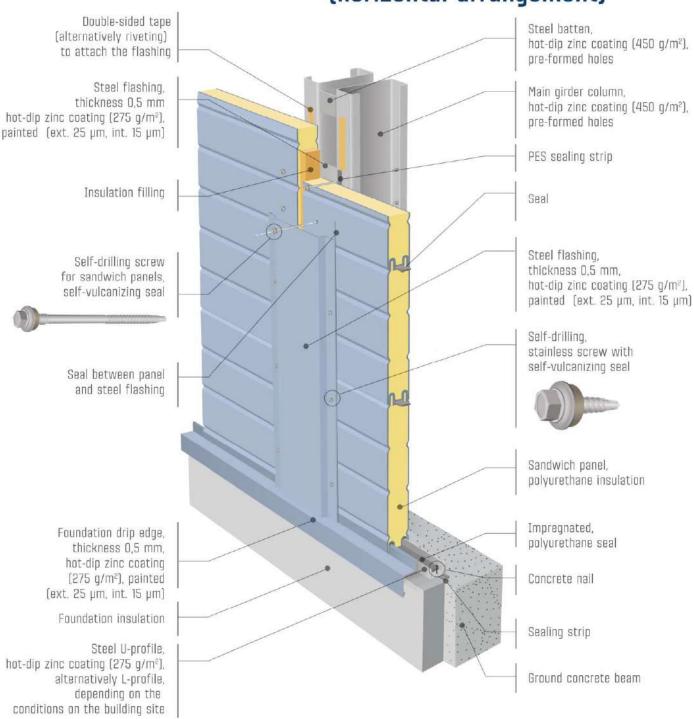








wall insulation - PUR sandwich panels (horizontal arrangement)



Heat transfer coefficients Uc [W/m²K]	8-16°C	PIR foam >16°C (2017)	>16°C (2021)
U _c required	0.45	0.23	0.20
Insulation thickness (mm)*	50	100	120
U _c	0.45	0,22	0.19
U ₀	0.45	0.22	0.19

* Insulation that meets required U_c

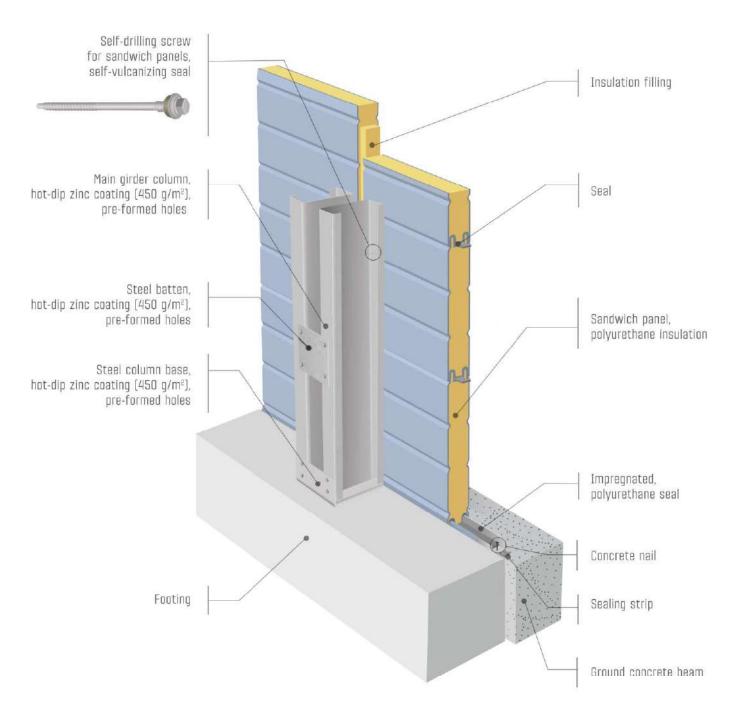








wall insulation - PUR sandwich panels (inner horizontal arrangement)



Heat transfer coefficients Uc [W/m²K]	8-16°C	PIR foam >16°C (2017)	>16°C (2021)
U _c required	0.45	0.23	0.20
Insulation thickness (mm)*	50	100	120
U _c	0.45	0,22	0.19
U ₀	0.45	0.22	0.19



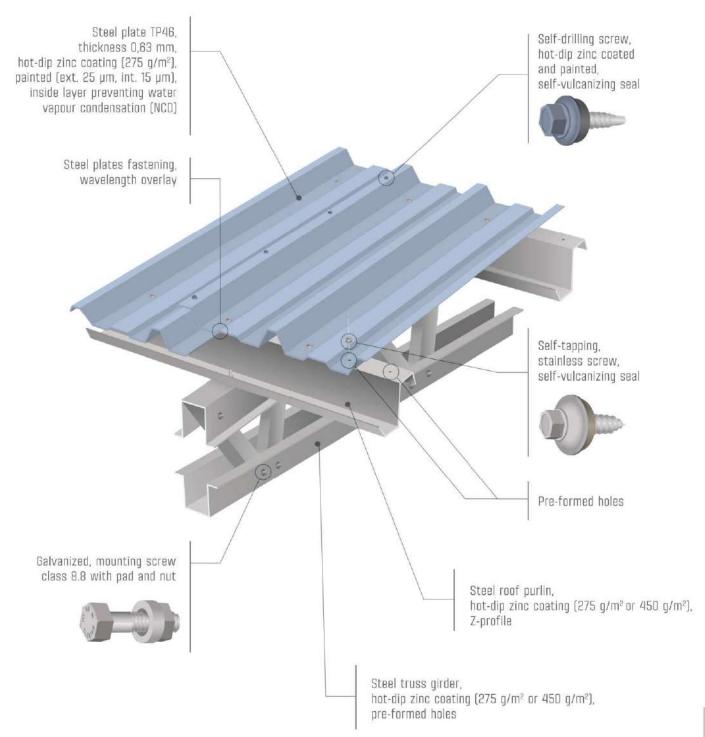








ROOF - TYPE O Uninsulated



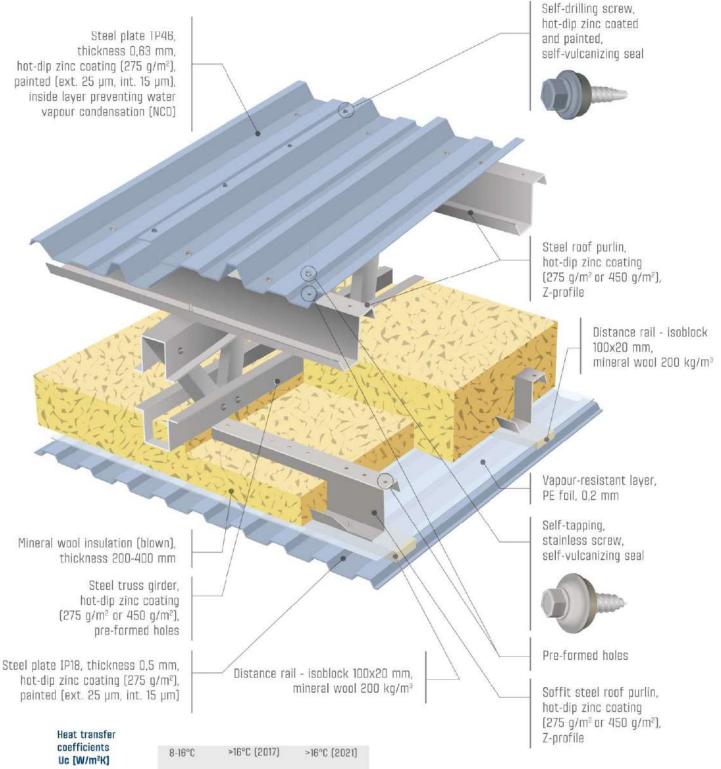








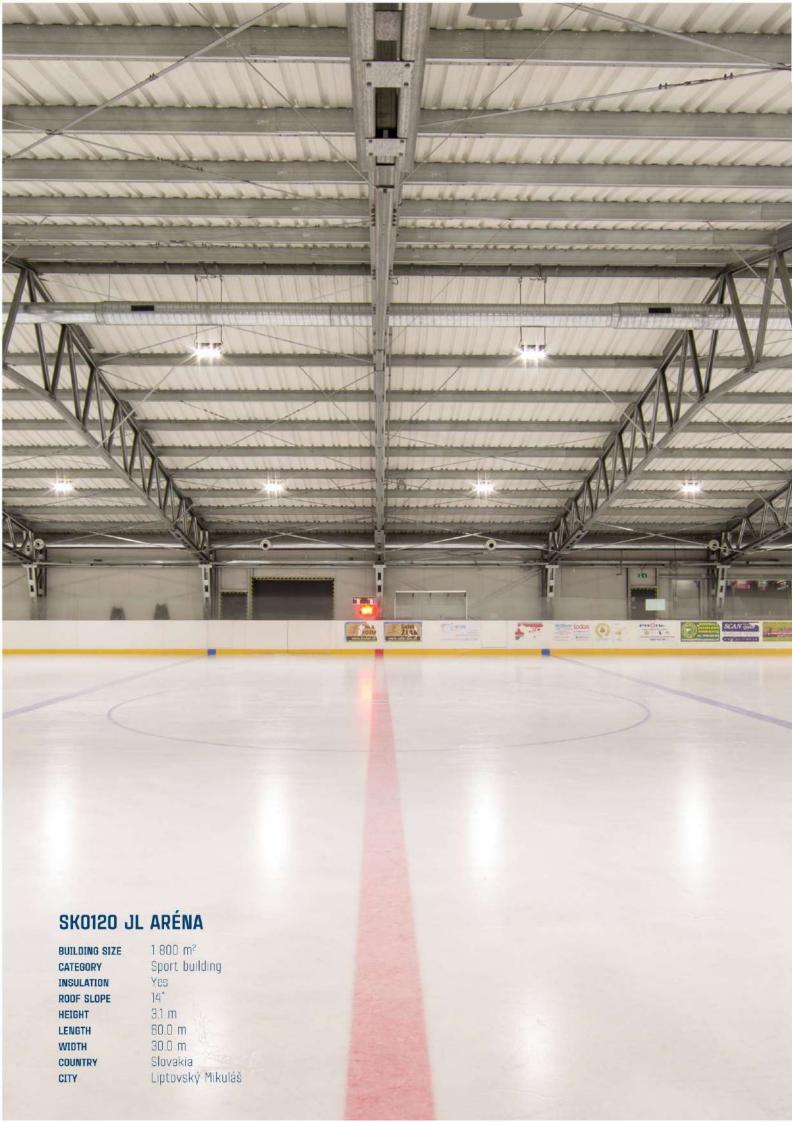
ROOF - TYPE 2LF roof insulation - compound cladding



coefficients Uc [W/m²K]	8-16°C	>16°C (2017)	>16°C (2021)
U _c required	0.30	0.18	0.15
Insulation thickness (mm)*	150	250	300
U _c	0.30	0.18	0.15
U ₀	0.25	0.15	0.13

^{*} Insulation that meets required U.

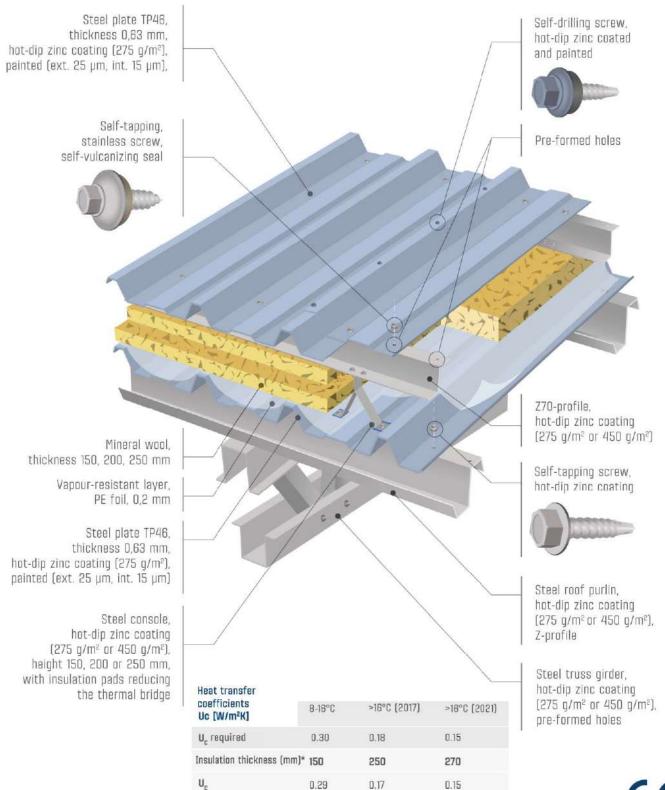








ROOF - TYPE 5 roof insulation - compound cladding



0.17

0.14

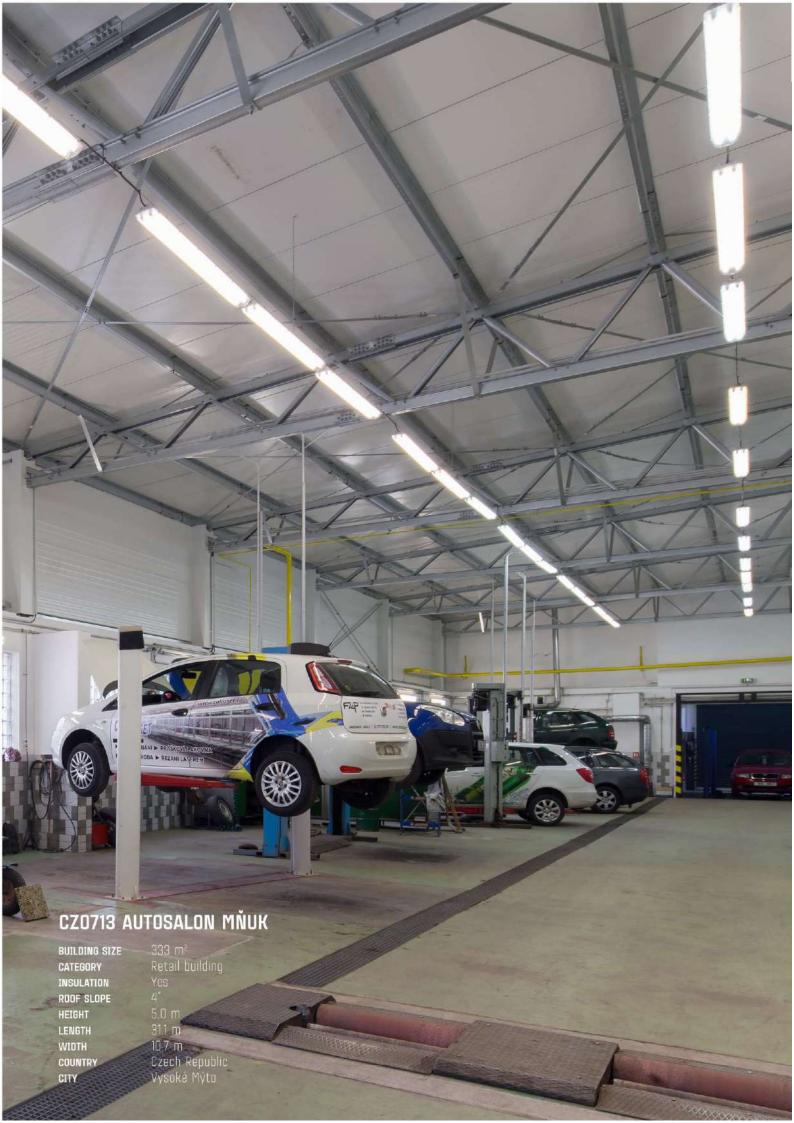
* Insulation that meets required U

0.23

U_o

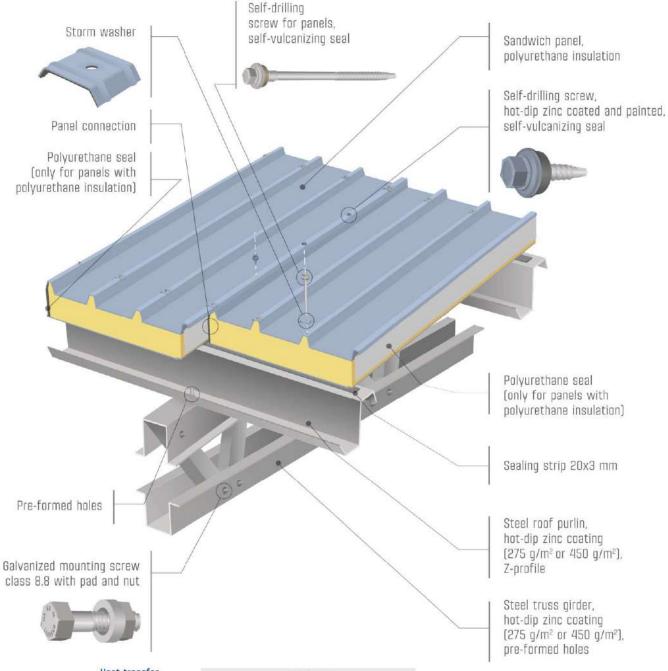
0.15

0.13





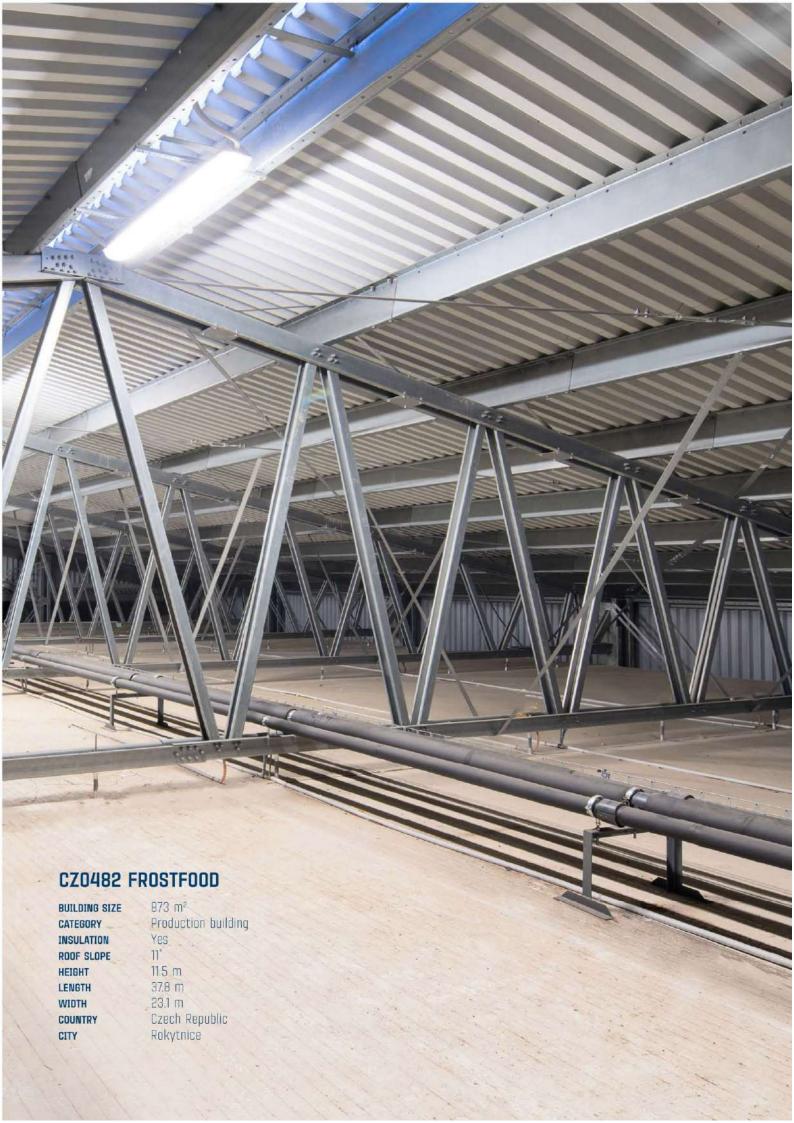
ROOF - TYPE 6 roof insulation - PUR sandwich panels



Heat transfer coefficients U _c [W/m²K]	8-16°C	PIR foam >16°C (2017)	>16°C (2021)
U _c required	0.30	0.18	0.15
Insulation thickness (mm)*	80	120	160
Uc	0.27	0.18	0.14
Un	0.27	0.18	0.14

* Insulation that meets required \mathbf{U}_{c}

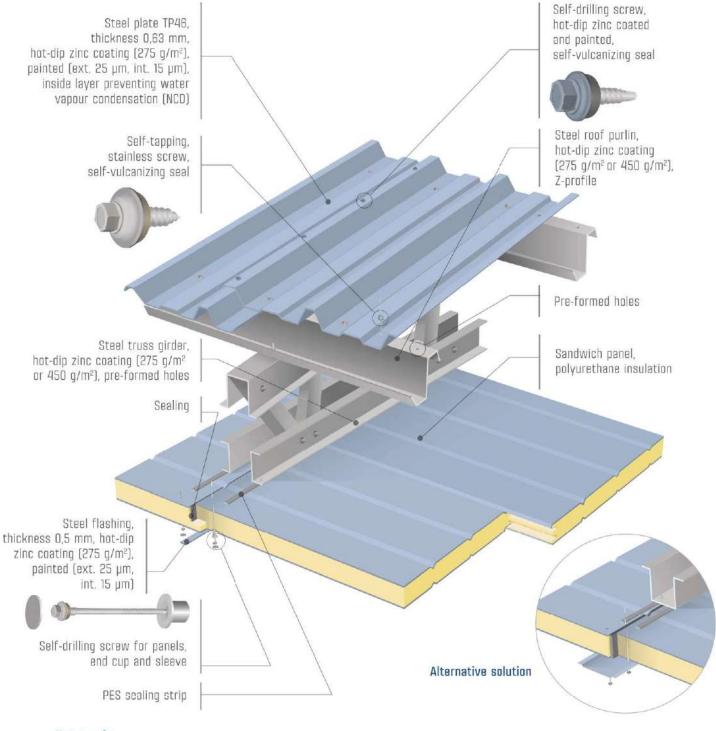








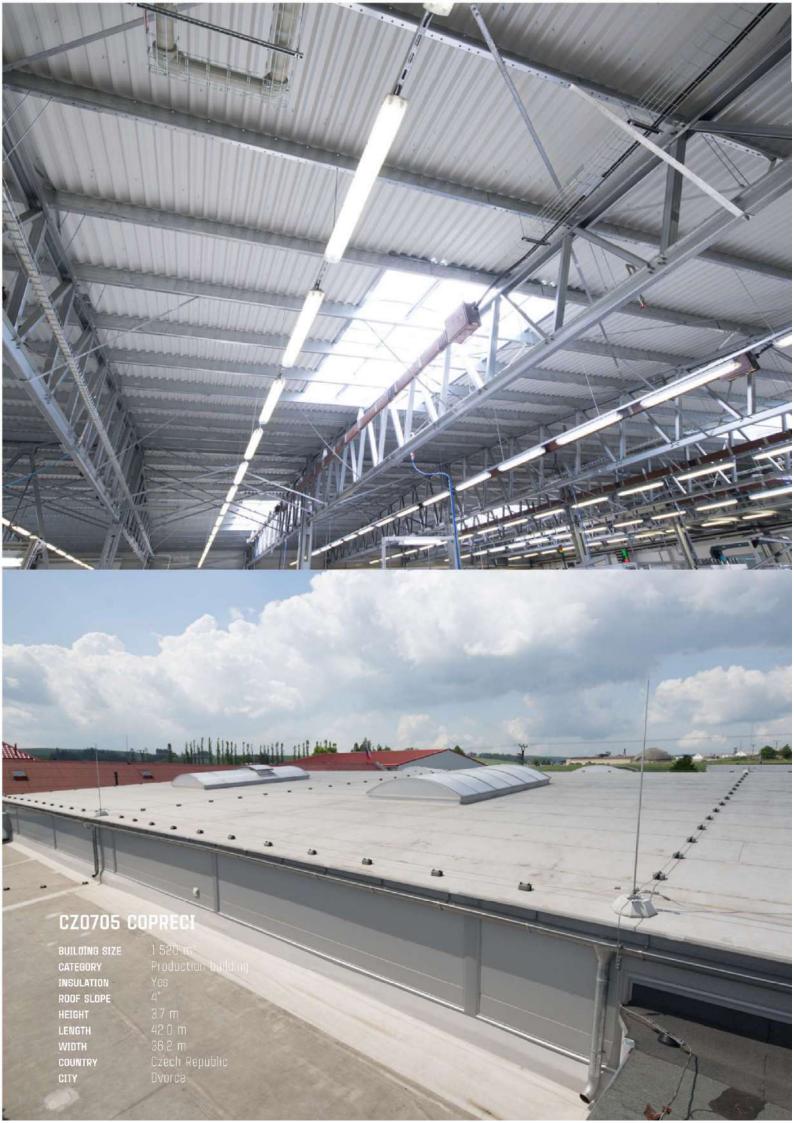
ROOF - TYPE 7W roof insulation - PUR sandwich panels



Heat transfer coefficients U _c [W/m²K]	-30°C (deep freeze store)	0°C - 8°C (cold store)	>16°C (2017)	>16°C (2021)
U _c required	-	÷	0.18	0.15
Insulation thickne	ess (mm)* 160	100	120	160
U _c	0.14	0.22	0.18	0.14
U ₀	0.14	0.22	0.18	0.14

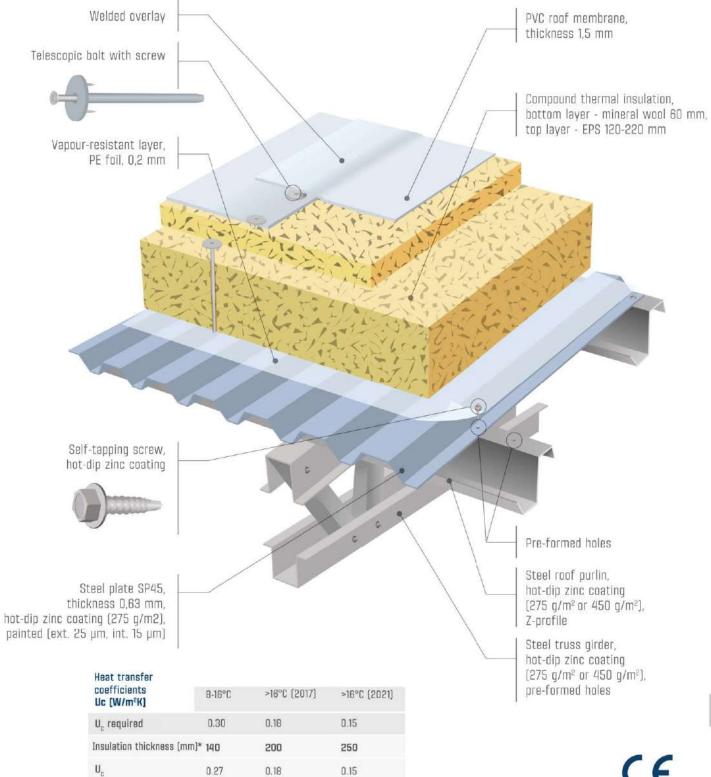
* Insulation that meets required U,







ROOF - TYPE SP roof insulation - compound cladding



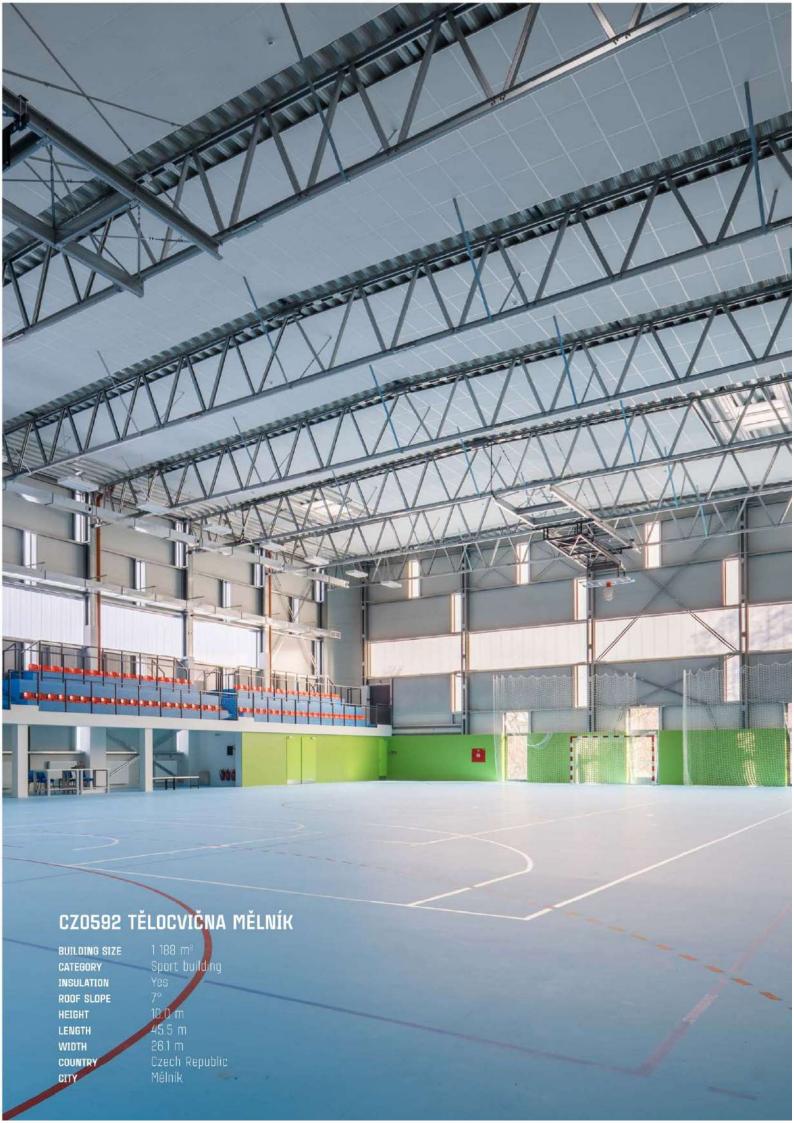
0.15

0.18

0.27

U_o

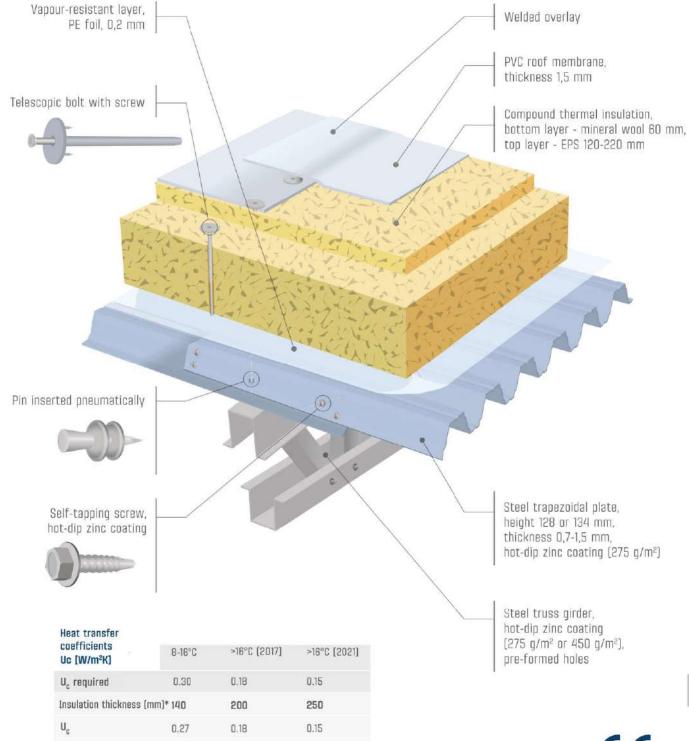
EN 1090-1





U,

ROOF - TYPE SPH roof insulation - compound cladding



0.15

0.18

0.27

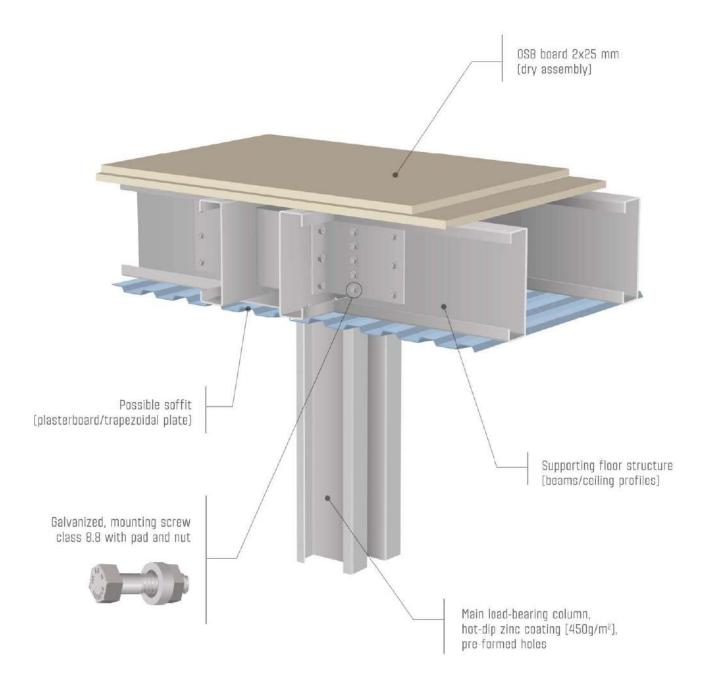






FLOOR - OSB BOARDS dry assembly

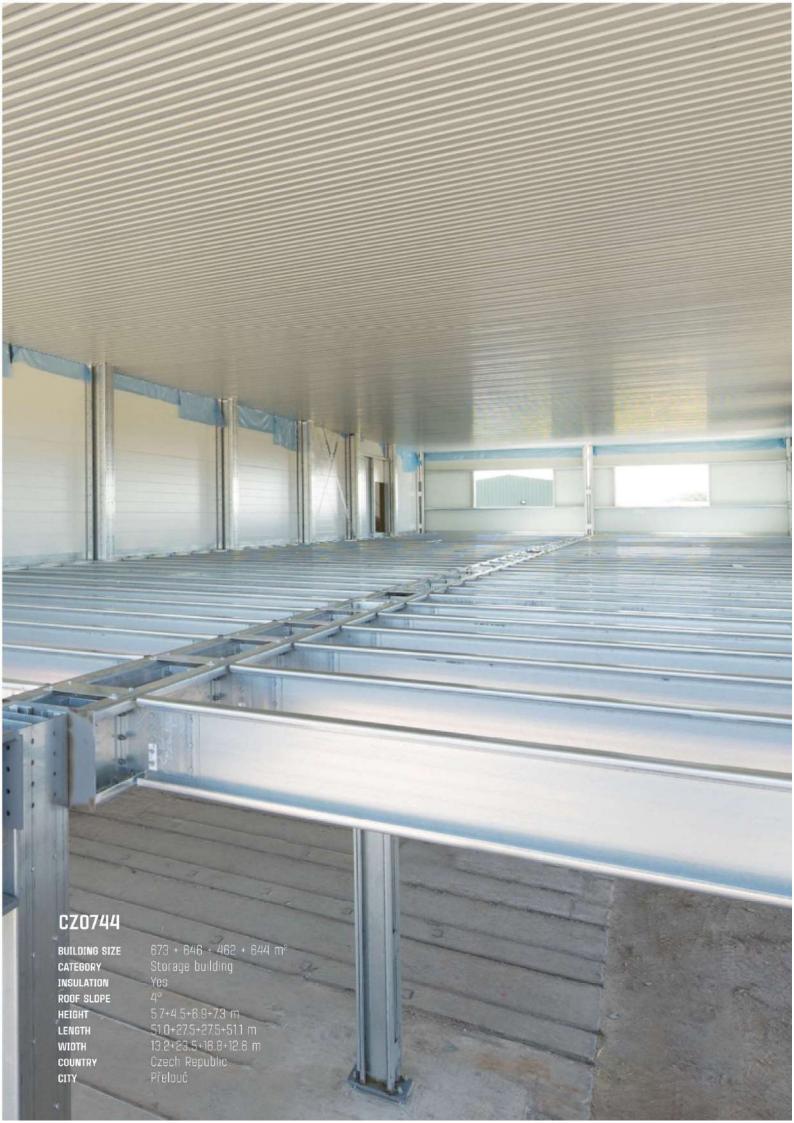
The floor consists of a system of ceilings profiles and beams, on which a load-bearing layer of OSB boards is laid. The boards can be laid in one to three layers, depending on the required load and the distance of the ceilings profiles.



LOADING AREAS CATEGORIES	A, E
SPAN	3 - 7 m
PERMISSIBLE LOADING	2,5 - 5,0 kN/m² (depending on the load-bearing capacity of OSB boards)
FLOOR SUPPORTING STRUCTURE THICKNESS	300 - 500 mm incl. beams/ceiling profiles



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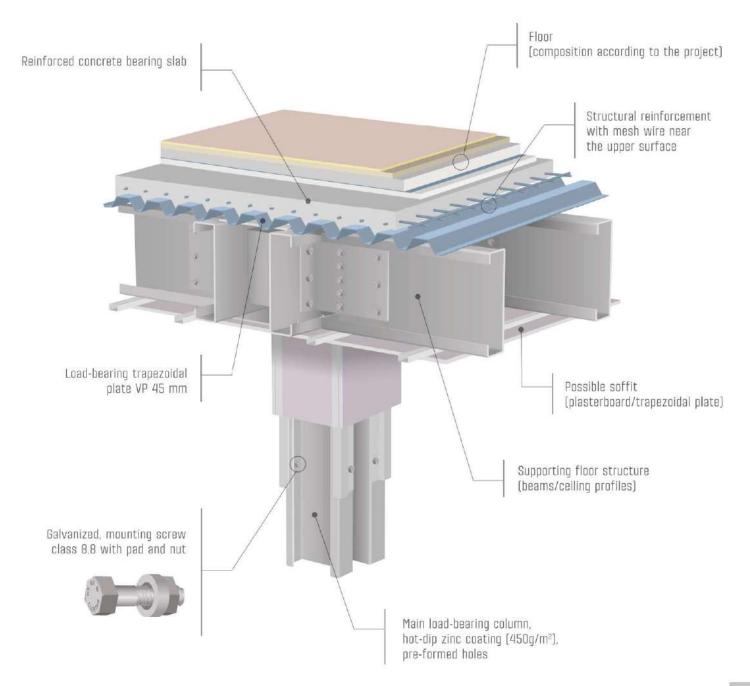






FLOOR - LLENTAB load-bearing trapezoidal plate

The floor consists of a system of ceilings profiles and beams, on which a load-bearing trapezoidal plate is placed. A concrete bearing layer is poured into the trapezoidal plate, which is structurally reinforced with mesh wire near the upper surface. The final composition of the floor is then created on the concrete layer.



LOADING AREAS CATEGORIES	A, B, C1
SPANS	3 - 7 m
PERMISSIBLE LOADING	2,5 - 7,0 kN/m²
FLOOR SUPPORTING STRUCTURE THICKNESS	370 - 650 mm incl. beams/ceiling profiles

Nate: Fire resistance can be ensured by a fire-resistance ceiling
Consult LLENTAB technical department for any different uses.



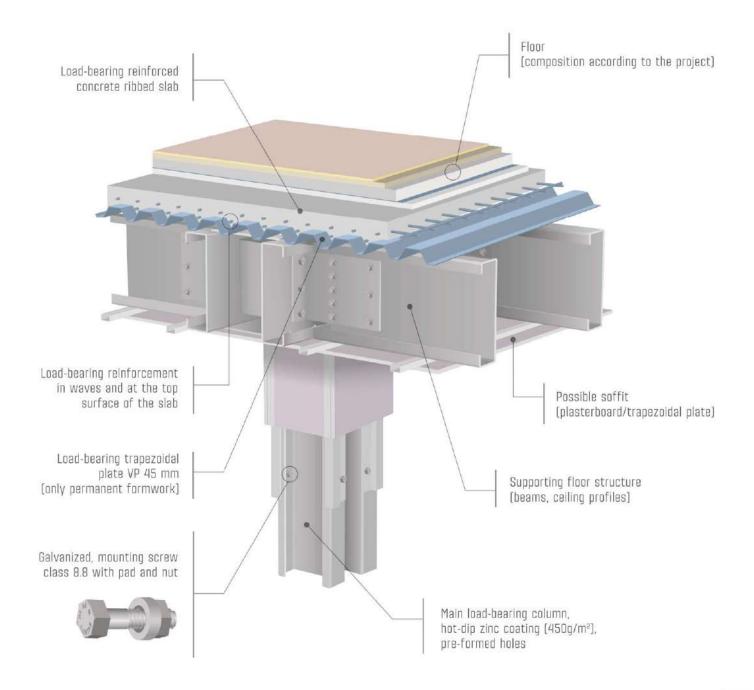






FLOOR - RC SLAB LOW low trapezoidal plate (formwork)

The floor consists of a system of ceiling profiles and beams, on which a load-bearing concrete ribbed slab is poured. The slab is reinforced at the top and bottom surface (in waves). The slab is poured into the permanent formwork made of low trapezoidal metal plate. The final composition of the floor is then created on the concrete slab.



LOADING AREAS CATEGORIES	A, B, C1-C5, D1, E1, F
SPANS	3 - 7 m
PERMISSIBLE LOADING	2,5 - 5,0 kN/m²
FLOOR SUPPORTING STRUCTURE THICKNESS	420 - 650 mm incl. beams/ceiling profiles

Nate: Fire resistance can be ensured by a fire-resistance ceiling.

Consult LLENTAB technical department for any different uses.



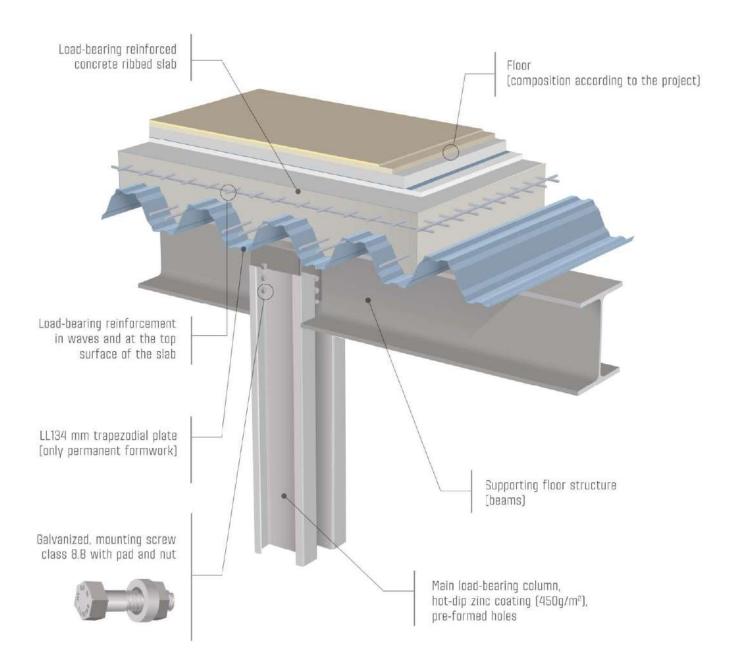




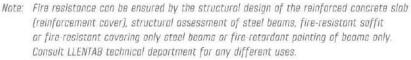


FLOOR - RC SLAB HIGH high trapezoidal plate (formwork)

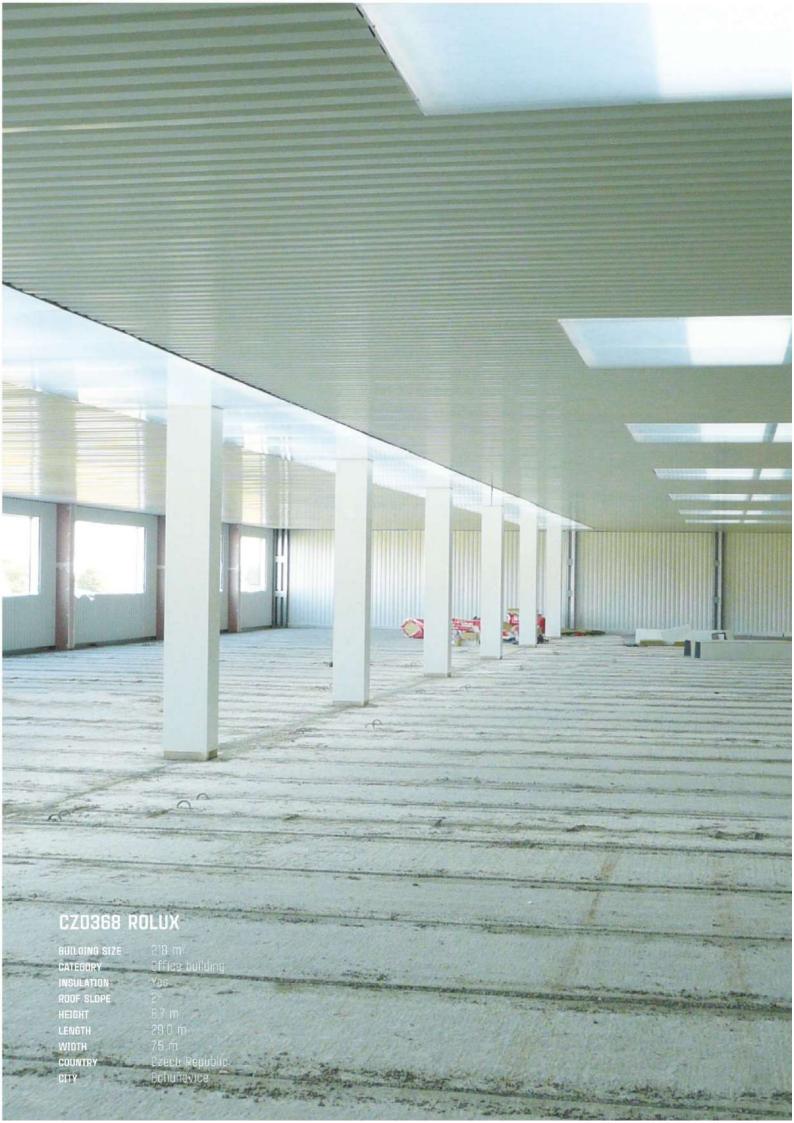
The floor consists of hot-rolled steel beams in the shape of IPE, HEA or HEB, which are anchored to the columns. A load-bearing reinforced concrete ribbed slab is placed on the beams. The slab is cast into trapezoidal steel plates serving as permanent formwork.



LOADING AREAS CATEGORIES	A, B, C1-C5, D1, E1, F	
SPANS	3 - 7 m	
PERMISSIBLE LOADING	2,5 - 7,5 kN/m²	
FLOOR SUPPORTING STRUCTURE THICKNESS	500 - 600 mm	





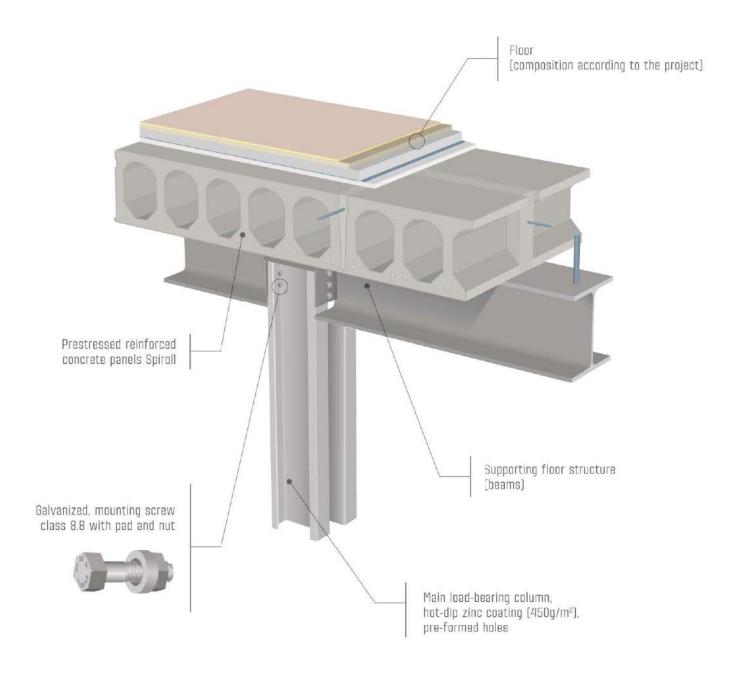






FLOOR - SPIROLL prestressed reinforced concrete panels

The floor consists of hot-rolled steel beams in the shape of IPE, HEA or HEB, which are anchored to the columns. Supporting prestressed reinforced concrete panels SPIROLL are laid on the beams.



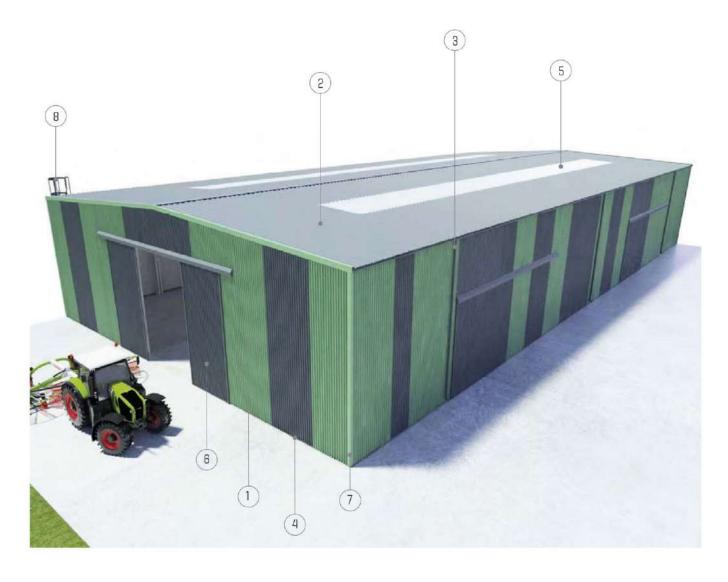
LOADING AREAS CATEGORIES	A, B, C1-C5, D1, E, F	
SPANS	3 - 12 m	
PERMISSIBLE LOADING	2,5 - 10,0 kN/m²	
FLOOR SUPPORTING STRUCTURE THICKNESS	160 - 400 mm excl. beams, 410 - 750mm incl. beams	

Note: Fire resistance can be ensured by the structural design of the panels, structural assessment of steel beams, fire-resistant soffit or fire-resistant covering only steel beams or fire-retardant painting of beams only.

Consult LLENTAB technical department for any different uses.



WALL - TYPE O ROOF - TYPE O



- 1 Steel trapezoidal plate VP45, thickness 0,5 mm, hot-dip zinc coating (275 g/m²), painted (ext. 25 µm, int. 15 µm)
- 2 Steel trapezoidal plate TP46 with NCD, thickness 0,63 mm, hot-dip zinc coating (275 g/m²), painted (ext. 25 µm, int. 15 µm),
- (3) Gutter and downpipes
- 4 Foundation drip edge

- 5 Roof skylights
- 6) Outside slideside gate
- 7 Corner flashing
- 8 Ladder



WALL - TYPE 3 ROOF - TYPE 5



- 1 Steel trapezoidal plate VP45, thickness 0,5 mm, hot-dip zinc coating (275 g/m²), painted (ext. 25 µm, int. 15 µm)
- 2 Steel trapezoidal plate TP46, thickness 0,63 mm, hot-dip coating (275 g/m²), painted (ext. 25 µm, int. 15 µm),
- 3 Gutter and downpipes
- 4 Canopy
- 5 Plastic or aluminum windows

- 6 Roof skylights and smoke exhaust vents
- 7 Overhead gate
- 8 Loading dock
- (9) Glass facade
- (10) Ladder



WALL - TYPE 6 ROOF - TYPE 6



- 1 Wall sandwich panel
- 2 Roof sandwich panel
- 3 Gutter and downpipes
- (4) Foundation drip edge
- 5 Corner flashing

- B Roof skylights and smoke exhaust vents
- 7 Overhead gate
- 8 Steel doors
- 9 Plastic or aluminium windows
- (10) Ladder



WALL - TYPE 6W ROOF - TYPE 7W



- 1 Steel trapezoidal plate VP45, thickness 0,5 mm, hot-dip zinc coating [275 g/m²], painted (ext. 25 µm, int. 15 µm)
- 2 Steel trapezoidal plate TP46, thickness 0,63 mm, hot-dip zinc coating (275 g/m²), painted (ext. 25 µm, int. 15 µm),
- 3 Gutter and downpipes
- 4 Refrigeratory panel
- 5 Plastic or aluminum windows

- B Main load-bearing column, hot-dip zinc coating (450 g/m²)
- 7 Overhead gate
- 8 Loading dock
- 9) Steel doors
- (10) Bracing



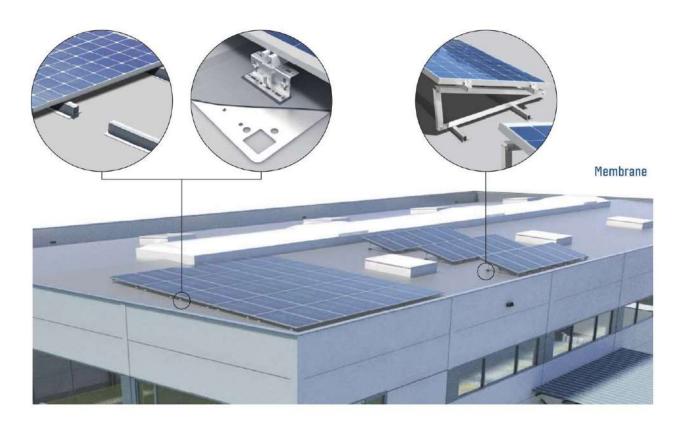


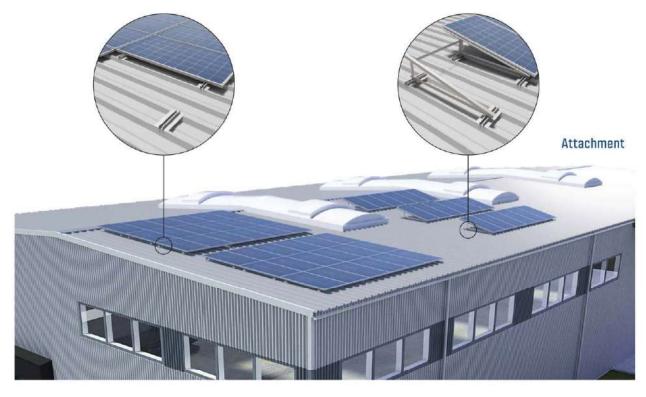
- Wall sandwich panel
- PVC roof membrane
- 3 Attic
- 4) Roof outlet
- Wall light / windows

- 6 Loading dock
- Roof skylights and smoke exhaust vents
- 8 Smoke exhaust vents
- 9 Canopy
- (10) Glass facade
- 11 Ladder



PHOTOVOLTAIC PANELS SOLUTION







COLOUR GUIDE - GUTTERS AND PIPES

Standard INTENSIVE BLACK (9005) TESTA DI MORO (8028) ANTHRACITE (7016) STEEL RED (3009) COPPER BROWN (8004) GRAY WHITE (9002) WHITE ALUMINUM (9006) METALLIC COPPER MOSS GREEN (6005) DARK BLUE (5010) GRASS GREEN (6011)



COLOUR GUIDE - CLADDING



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